

SYNTHESIS OF $Y_1Ba_2Cu_3O_x$ SUPERCONDUCTING POWDERS
BY INTERMEDIATE PHASE REACTION.

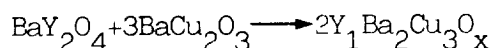
C. MOURE, J.F. FERNANDEZ, P. RECIO and P. DURAN.

Instituto de Cerámica y Vidrio, CSIC, Electroceramics Department
28500 Arganda del Rey, Madrid. SPAIN.

One of the more striking problems for the synthesis of the $Y_1Ba_2Cu_3O_x$ compound is the high-temperature decomposition of the $BaCO_3$. This compound is present as raw material or as an intermediate compound in chemical processes such as amorphous citrate, coprecipitation oxalate, sol-gel process, acetate pyrolysis, etc. This fact difficulties the total formation reaction of the $Y_1Ba_2Cu_3O_x$ phase and leads to the presence of undesirable phases such as the $BaCuO_2$ phase, the "green phase", Y_2BaCuO_5 and others.

In the present work a new procedure to overcome this difficulty is studied. The barium cation is previously combined with yttrium and/or copper to form intermediate compounds which can react between them to give $Y_1Ba_2Cu_3O_x$.

BaY_2O_4 and $BaCu_2O_3$ react according to the following equation



BaY_2O_4 is a stable compound of the Y_2O_3 -BaO system, $BaCu_2O_3$ is an intimate mixture of $BaCuO_2$ and uncombined CuO.

The reaction kinetics of these phases have been established between 860 and 920°C. The phase evolution has been determined. The crystal structure of the $Y_1Ba_2Cu_3O_x$ obtained powder was studied by means of XRD. According to the results obtained from the kinetics study the $Y_1Ba_2Cu_3O_x$ the synthesis was performed at temperatures of 910-920°C for short treatment times (1-2 hours). Pure $Y_1Ba_2Cu_3O_x$ was prepared, which develops orthorhombic type I structure despite of the cooling cycle. Superconducting transition took place at 91 K.

The sintering behaviour and the superconducting properties of sintered samples were studied. Density, microstructure and electrical conductivity were measured. Sintering densities higher than 95% D_{th} were attained at temperatures below 940°. Relatively fine grained microstructure were observed, and little or no-liquid phase was detected.